

APPLICATIONS OF SEAWINDS SCATTEROMETER TO REMOTE SENSING OF GEOPHYSICAL MEDIA

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ABSTRACT

In this paper, we present results for a number of new applications to remote sensing of geophysical media using global Ku-band backscatter data acquired by the SeaWinds scatterometer on QuikSCAT (QSCAT) satellite. QSCAT was launched from the Vandenberg Air Force Base on a Titan-II launch vehicle in June 1999, and has been operated almost flawlessly since. The SeaWinds scatterometer on board QSCAT is a Ku-band scatterometer (at 13.4 GHz) with the horizontal-polarization beam at 46° and the vertical-polarization beam at 54° incidence angle. It has the following unique features: (1) very wide swath (up to 1800 km), with 92% global coverage in one day, and twice daily coverage at higher latitudes ($>40^\circ$) for studying the diurnal effects; (2) capability to obtain relatively high resolution backscatter data (7 km x 25 km) through the transmission of a linear frequency modulated chirp with a bandwidth of about 250 kHz; (3) very high relative radiometric accuracy of 0.2 dB; and (4) constant incidence angles enabling simple and accurate determination of land and ice geophysical parameters. Although originally designed for ocean wind measurements, QSCAT backscatter data are collected globally all the time, and the data can be used for global land and water surface applications. Derived from the SeaWinds/QuikSCAT data set, remote sensing results of geophysical media include: (1) global snow detection and monitoring, (2) melt region mapping on the Greenland ice sheet, (3) monsoon flood detection and monitoring, (4) soil wetness application at large scale, (5) remote sensing of ecosystem dynamics, (6) hurricane monitoring and tracking, and (7) daily mapping of wind fields over the Great Lakes. Scatterometer results are compared and confirmed with in-situ measurements and field observations. We illustrate the utility of the scatterometer by presenting several cases of severe natural disasters occurred in the past year.

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